AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A switched reluctance electric machine comprising:

a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stator segment core and winding wire that is <u>precisely</u> wound around <u>individual ones of</u> said stator segment core ~~using a precise winding method~~ to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%;

a rotor defining a plurality of rotor poles, wherein said rotor tends to rotate relative to said stator to maximize the inductance of an energized winding; and

a sensorless drive circuit that derives rotor position based on parameters that ~~relate to~~ <u>vary with</u> at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived position of said rotor.

2. (Original) The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of said winding wire of one of said stator segment assemblies wherein said sensorless drive circuit derives said rotor position from said sensed inductance.

3. (Original) The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates a diagnostic pulse that is output to said winding wire of one of said stator segment assemblies, wherein said sensorless drive circuit derives said rotor position based on a sensed change in phase current due to said diagnostic pulse.

4. (Original) The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit determines rotor position by monitoring a slope of a current waveform related to current flowing in said energized winding and by identifying when said slope is zero.

5. (Original) The switched reluctance electric machine of claim 1 wherein said sensorless drive circuit monitors current and flux and employs a look up table to determine said derived position of said rotor.

6. (Original) The switched reluctance electric machine of claim 1 wherein said stator segment core includes stator plates with an outer rim section and a tooth section that extends radially inwardly from a center portion of said outer rim section.

7. (Original) The switched reluctance electric machine of claim 6 further comprising:

an insulation layer located between said winding wire and said stator segment core.

8. (Original) The switched reluctance electric machine of claim 1 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

9. (Currently Amended) The switched reluctance electric machine of claim 8 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section.

10. (Original) The switched reluctance electric machine of claim 6 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stack of stator plates together.

11. (Currently Amended) A sensorless switched reluctance electric machine comprising:

a stator;

a rotor;

a machine housing;

a plurality of circumferentially-spaced stator segment assemblies that are arranged around an inner surface of said machine housing;

said stator segment assemblies defining a salient stator pole that extends in a radially inward direction;

said stator segment assemblies including a stator segment core and winding wire that is precisely wound around individual ones of said stator segment core ~~using a precise winding method~~ to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%; and

a sensorless drive circuit that is connected to said winding wire, that derives rotor position based on parameters that ~~relate to~~ vary with at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived position of said rotor.

12. (Original) The sensorless switched reluctance electric machine of claim 11 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of one of said stator segment assemblies, wherein said sensorless drive circuit derives said rotor position based on said sensed inductance.

13. (Original) The sensorless switched reluctance electric machine of claim 11 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates diagnostic pulses that are output to one of said stator segment assemblies, wherein said sensorless drive circuit senses changes in phase current resulting from said diagnostic pulses and derives said rotor position therefrom.

14. (Original) The switched reluctance electric machine of claim 11 wherein said sensorless drive circuit determines rotor position by monitoring a shape of a current waveform related to current flowing in said energized winding and by identifying when said slope is zero.

15. (Original) The switched reluctance electric machine of claim 11 wherein said sensorless drive circuit monitors current and flux and employs a look up table to determine said derived position of said rotor.

16. (Original) The sensorless switched reluctance electric machine of claim 11 wherein said stator segment core includes stator plates with a radially outer rim section and a tooth section that extends radially inwardly from said radially outer rim section.

17. (Original) The sensorless switched reluctance electric machine of claim 16 further comprising:

an insulation layer located between said winding wire and said stator segment core.

18. (Original) The sensorless switched reluctance electric machine of claim 16 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

19. (Currently Amended) The sensorless switched reluctance electric machine of claim 18 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect inner ends of said first and second end caps,

wherein said first and second end caps and said first and second axial end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use <u>and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section</u>.

20. (Original) The sensorless switched reluctance electric machine of claim 16 wherein said stator plates of said stator segment core include radial and lateral slits

and first and second central portions that are deformed to hold said stator segment core together.

21. (Currently Amended) A sensorless switched reluctance electric machine comprising:

a machine housing;

a rotor that rotates relative to said machine housing;

a stator that is mounted on an inner surface of said machine housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is precisely wound around individual ones of said stator segment core ~~using a precise winding method~~ to provide substantially uniform inductance and resistance characteristics, wherein said windings define a slot fill that is greater than 65%, and wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section; and

a sensorless drive circuit that derives rotor position based on parameters that ~~relate to~~ vary with at least one of said substantially uniform inductance and resistance characteristics of said stator segment assemblies and that energizes said winding wire around said stator segment assemblies to control operation of said switched reluctance machine based on said derived rotor position.

22. (Original) The sensorless switched reluctance electric machine of claim 21 further comprising:

an insulation layer located between said winding wire and said stator segment cores.

23. (Original) The sensorless switched reluctance electric machine of claim 21 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

24. (Currently Amended) The sensorless switched reluctance electric machine of claim 23 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend adjacent to said projections and that connect inner ends of said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections define an annular retention channel that reduces movement of said winding wire during use <u>and wherein said first and second end caps and said first and second end cap retainer sections are not located between said winding wire and axial side surfaces of said tooth section</u>.

25. (Original) The sensorless switched reluctance electric machine of claim 21 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

26. (Original) The sensorless switched reluctance electric machine of claim 21 wherein said sensorless drive circuit includes an inductance sensor that senses inductance of one of said stator segment assemblies.

27. (Original) The sensorless switched reluctance electric machine of claim 21 wherein said sensorless drive circuit includes a diagnostic pulse generator that generates diagnostic pulses that are output to one of said stator segment assemblies.

REMARKS

Claims 1-27 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 1-27 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicant regards as the invention. This rejection is respectfully traversed.

The Examiner objects to the use of the term precise winding. Applicants have amended Claims 1, 11 and 21 to require precise winding of individual stator segment cores, as described in the specification at several locations. **See, e.g. ¶ [0044], [0057], and [0064].**

Winding in the confined space of a non-segmented stator severely reduces the slot fill and the precision of the winding process. For example, the needle used in the needle winding approach must be inserted in the relatively small area provided between adjacent stator windings. Transfer winding methods wind the wire off of the stator teeth and then transfer the windings onto the stator teeth. Both methods fall to position the wire precisely on the non-segmented stator teeth due to the limited space that is available.

Once the stator is segmented, the windings can be wound more precisely. For example, needle winding and transfer winding may be used more effectively. In addition, computer numerical controlled winding machines can now be used.

As a result of the segmenting of the stator and the higher precision of the winding process, the inductance and resistance characteristics of the stator poles can be made more uniform from one stator pole to another. This, in turn, makes it easier to implement sensorless rotor position sensors.

Some of the sensorless drive circuits derive rotor position by sensing the inductance of the stator. In these sensorless drive circuits, the measured parameter is the current flowing in unenergized windings. The current flowing in these unenergized windings may be relatively small. Therefore, minor variations in resistance and/or inductance of the stator windings may have a significant impact on this measured parameter. It is easier to use the measured parameter to estimate rotor position when the actual inductance and/or resistance values are more uniform from one stator pole to another.

In other sensorless drive circuits, the measured parameter is the rise time of current in a stator winding between two current levels. The inductance of the phase coil can be calculated from the rise time. Once the inductance is known, the rotor position is estimated. The rise time is also impacted by variations in the inductance and/or resistance between stator windings.

In still other sensorless approaches, voltage sensing pulses are output to unexcited phases. The voltage sensing pulses cause a change in phase current (the measured parameter) that is inversely proportional to the instantaneous phase inductance. This parameter is also impacted by variations in the inductance and/or resistance between stator windings.

During the interview on 4/10/03 with Examiners Gonzalez and Tomai, Applicants pointed out the synergistic effect of a switched reluctance machine with a segmented stator, a high slot fill and a sensorless rotor position circuit. By segmenting the stator, the slot fill can be increased and the windings can be more precise wound.

The fact that the individual segmented stators can be wound separately allows the stator pole windings to be precisely positioned. The precision winding approach is not possible with non-segmented stators due to clearance issues. The precision winding approach improves the uniformity of resistance and/or inductance characteristics of the stator segment assemblies. The increased uniformity makes the sensorless approach easier to implement.

During the interview, the Examiners encouraged Applicants to amend the claims to more clearly define the relationship between the segmented stator, improved electrical characteristics, and sensorless control. In fact, Examiner Gonzalez called Applicants and indicated that the case was allowable based upon the Supplemental Amendment. At no time did either of the Examiners question what was meant by precisely winding the individual stator segment cores. In addition, neither Examiner questioned the idea that segmenting the stator and winding the stator segments individually before assembly would improve the inductance and/or resistance characteristics from one stator winding to another and measured parameters that are based thereon.

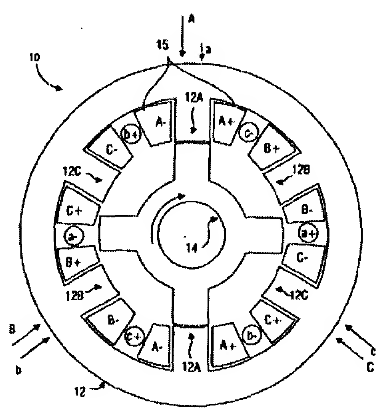
For the foregoing reasons, Applicants believe that this rejection is now moot.

REJECTION UNDER 35 U.S.C. § 103

Applicants traverse the rejection of Claims 1, 2, 6-8, 11, 12, 16-18, 21-23 and 26 under 35 U.S.C. § 103 as being unpatentable over Tang (U.S. Patent No. 5,811,905) in view of Takeuchi et al. (U.S. Patent No. 5,583,387) and Oki (JP Pat. No. 411289701A).

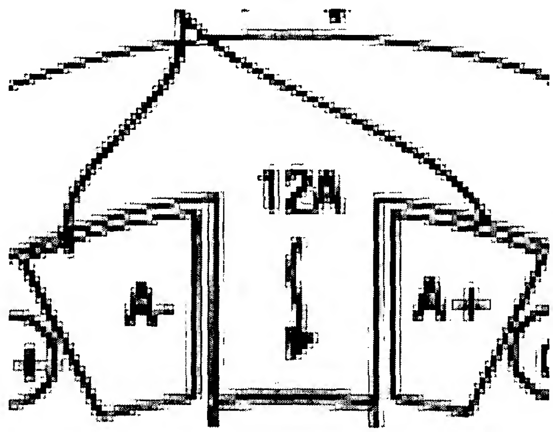
With respect to independent claims 1, 11, and 21, Tang does not show, teach or suggest a switched reluctance machine with a segmented stator, as admitted by the Examiner.

Tang also does not show, teach or suggest a stator having a slot fill that is greater than 65%. The Examiner incorrectly asserts that Tang inherently shows a switched reluctance motor with a slot fill above 65%. In support thereof, the Examiner solely relies upon FIG. 1 of Tang, which is set forth below:



Applicants respectfully assert that FIG. 1 does not inherently show slot fill that is greater than 65% for several reasons. The drawing is in schematic form and does not appear to show relative sizes. For example, the windings are not uniformly wound around the stator teeth. In particular, A- and A+ have different sizes and are not symmetric, which would be impossible since the same winding wire that is used to wind A+ would also

form A-. The other stator windings are also not symmetric on opposite sides of the stator teeth. An enlarged view of A+ and A- is provided below:



As best understood by Applicants, the specification of Tang is silent as to slot fill. In FIG. 1, Tang shows large gaps (labeled a+, a-, b+, b-, c+, and c-), which that do not include winding wire and which Applicants believe would reduce the slot fill percentage below 65%. The relative sizing of the poles and slots also do not appear to be correct.

More importantly, however, since the stator is not segmented, either needle winding or transfer winding methods would be used to wind the stator. Neither of these approaches achieve slot fills that are greater than 65%. **Applicants Specification ¶ [00015].** At best, Tang could achieve the 60-65% of transfer winding discussed by Applicants.

Furthermore, Applicants are not claiming high slot fill in isolation. Applicants have claimed high slot fill in combination with a segmented stator with individually wound stator segments and a sensorless drive circuit. By allowing the stator segments to be wound before assembly (which can only be done with segmented stators), the electrical uniformity of inductance and resistance of the stator poles can be improved. This makes the sensorless drive circuit easier to implement.

With respect to independent claims 1, 11, and 21, Takeuchi et al does not show, teach or suggest a switched reluctance machine. Takeuchi et al also does not show, teach or suggest a sensorless drive circuit that derives rotor position and that energizes the winding wire around the stator segment assemblies to control the operation of the switched reluctance machine based on the derived rotor position.

With respect to independent claims 1, 11, and 21, Oki also does not show, teach or suggest a sensorless drive circuit that derives rotor position and that energizes the winding wire around the stator segment assemblies to control the operation of the switched reluctance machine based on the derived rotor position.

Oki does not show, teach or suggest a stator having a slot fill that is greater than 65%. Oki also does not expressly address switched reluctance machines. The Examiner incorrectly characterizes Oki by stating that "Oki teaches ... for the purpose of making a motor with superior electromagnetic performance that a reluctance motor may be made by having a segmented stator." **Office Action at p. 4.** In support of this statement, the Examiner relies upon FIG. 4 of Oki, which admittedly shows a segmented stator for a reluctance machine.

However, the text of Oki clearly states that the stator was segmented to make the assembly/manufacturing of the machine easier. Oki states:

> Accordingly, due to the fact that the stator is divided for each electrode unit, it is possible to readily carry out the coil-winding operation for each layered core, so as to enhance the efficiency of producing reluctance motors.

Oki translation at pp. 3-4. Therefore, Oki segments that stator to make manufacturing easier – not to improve the electromagnetic characteristics of the switched reluctance

machine or to make the sensorless approach easier to implement. Oki fails to increase the slot fill beyond the percentage that could be obtained using a non-segmented stator, as supported below.

As best understood, the only portion of Oki that related to improving electromagnetic performance is the removing of caulking and welding of the stator laminations, also discussed below.

In rejecting the claims, the Examiner incorrectly relies on **In re Fine**, 5 U.S.P.Q.2d, 1596 (CAFC 1988) and **In re Jones**, 21 USPQ.2d 1941 (Fed. Cir. 1992). **Final Office Action at p. 8.** The facts and the holdings of these cases do not support the Examiner's conclusion under §103.

In both cases, the CAFC reversed the Board and the Examiner based upon the Examiner's unsupported reliance upon the general knowledge of one skilled in the art. As was done in this case, the Examiners in both **In re Fine** and **In re Jones** combined features of two references in the same broad category of art and relied upon the general knowledge of one skilled in the art in making the combination. As was done in this case, the Examiners **In re Fine** and **In re Jones** did not support the combinations by identifying specific teachings, suggestions or motivations found in the references.

To reach a proper conclusion under §103, the Examiner must step back in time and into the shoes of the person of ordinary skill in the art when the invention was unknown and just before it was made. **In re Fine** at 1598. In light of all of the evidence, the Examiner must determine whether the claimed invention would have been obvious at that time to that person. **Id.**

As recognized in Tang and in Applicants Background of the Invention, switched reluctance machines require rotor position information for control. There are two approaches that are commonly used. The sensed approach uses a sensor that physically senses the rotor position. The sensed approach typically renders the switched reluctance machines too costly to compete with other types of machines. The increased cost has been a significant factor preventing the widespread use of switched reluctance machines.

To reduce costs, various sensorless approaches have been attempted. The sensorless approaches estimate rotor position from sensed machine characteristics such as back-EMF. Tang teaches that accurately estimating rotor position based on back-EMF is difficult due to the relatively low back-EMF signals.

As will be demonstrated below, none of the references suggest a solution to this problem. In particular, none of the references teaches the specific solution set forth in claims 1, 11 and 21. In fact, the problems that are addressed by each of the three references are mutually exclusive. Therefore, there is no teaching, suggestion or motivation in these references to support the combination of these references.

More particularly, Tang teaches a switched reluctance machine that includes a non-segmented stator with low slot fills using needle winding or transfer winding methods. Tang recognizes that the increased costs of employing rotor position transducers (RPTs) makes switched reluctance machines uncompetitive with respect to open loop induction machines. **(Tang, Col. 1, lines 46-52)**. Tang also recognizes that implementing the "sensorless" rotor position approach in switched reluctance machines

is difficult due to the low back-EMFs induced in the un-energized phase windings. **(Tang, Col. 1, lin s 52-60)**.

Tang does not discuss either torque density or space saving as potential problems in switched reluctance machine applications. Tang also does not provide any discussion that would lead a skilled artisan to segment the stator or to seek art that includes a segmented stator. Tang also fails to identify the variable electromagnetic characteristics of conventionally-wound windings as a problem.

To supplement the teachings of Tang, the Examiner relies upon Takeuchi et al., which teaches a permanent magnet machine with a segmented stator. **(Takeuchi et al. Col. 1, lines 14-17).** The problems that are addressed by Takeuchi et al., however, are different that those encountered by Tang. In particular, Takeuchi et al. segmented the stator of a permanent magnet machine to improve the torque density and to save space at the ends of the windings. **(Takeuchi et al. Col. 1, lines 19-24)**. The problems that are addressed by Takeuchi et al. (specifically low-back EMFs and the high cost of RPTs) do not relate to the problems encountered by Tang (torque density and saving space).

The Tang and Takeuchi et al. references do not discuss common problems that might motivate a skilled artisan to combine the references. In other words, these references are directed towards solving distinctly different, mutually-exclusive problems. Furthermore, the properties of and control approach for permanent magnet motors is significantly different than the properties of and control approach for switched reluctance machines. Based on the foregoing, there is no teaching, suggestion or motivation to combine Tang with Takeuchi et al.

The Examiner further relies upon Oki. Oki does not expressly address switched reluctance machines at all. Oki does not discuss sensorless control or problems that are associated with sensorless control. Oki is directed to the problem of poor electromagnetic performance of a reluctance machine due to the conventional caulking and welding of the stator plates. Oki states:

> Accordingly, due to the fact that the stator is divided for each electrode unit, it is possible to readily carry out the coil-winding operation for each layered core, so as to enhance the efficiency of producing reluctance motors.
>
> **[Problems to be solved by the Invention]** However, since the above-described prior art stator had electrodes formed by the layering of thin copper sheets, it was necessary to caulk and weld the tip parts of the electrodes, so that the electrodes would not become misaligned. There was thus the resulting drawback that the electromagnetic performance was affected at the caulking and welding sites, which lowered the performance of the reluctance motors.

Oki translation at pp. 3-4. Therefore, the caulking and welding was used to prevent misalignment of the layered stator plates in prior reluctance machines. Oki improved the electromagnetic performance of the electric machine by eliminating the caulking and welding.

Oki disclosed a complex winding tension technique that eliminated the caulking and welding and improved the electromagnetic efficiency of the reluctance machine. The Oki winding technique reduces the number of winding turns on the outer circumference side as compared to the inner circumference side. Clearly, the improved electromagnetic characteristics are a result of the elimination of the welding and caulking – not segmenting the stator.

According to Oki, the stator of the reluctance machine is segmented to improve manufacturing efficiency. **Id.** Oki also does not increase the slot fill above levels that

can be obtained through conventional methods. In particular, the slot fill of the segmented stator in Oki is approximately 62%, which is approximately in the range of conventional transfer winding (approximately 60-65% slot fill). **Declaration of Dr. Wallace at Paragraphs 3-4** (attached to the prior Amendment). Therefore, Oki did not segment the stator to improve the torque density either.

The prior art fails to provide the requisite teaching, suggestion or motivation that is required under §103 and by the CAFC in both **In re Fine** and **In re Jones**, upon which the Examiner relies. In fact, the unsupported reliance on the general knowledge of one skilled in the art that was made by the Examiner here is exactly the type of conclusion that supported the reversal of the Board and the Examiner by the CAFC in both **In re Fine** and **In re Jones**.

In supporting the combination, the Examiner states that the references "are well in the field of electric machines." **Final Office Action** at paragraph 9. The Examiner goes on to state:

> In response to applicant's arguments that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining and modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ.2d 1941 (Fed. Cir. 1992). **In this case, the references deal with electric machines, especially motors and improvements of such machines.**

Final Office Action at paragraph 10 (Emphasis added). In summary, the only teaching, suggestion, or motivation that is relied upon by the Examiner is simply that the references all relate to electric machines.

The Examiner's reasoning is exactly the type of speculation that formed the basis for reversal of the Examiner and the Board in **In r Jon s**:

> Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill in the herbicidal art would have been motivated to make the modifications of the prior art salts necessary to arrive at the claimed 2-(2 '-aminoethoxy) ethanol salt... We conclude that the PTO did not establish a prima facie case of obviousness.

In re Fine also rejected this reasoning. The prior art reference related to a similar device – namely gas chromatographs. **Id.** The prior art chromatograph detected sulfur while Applicants' chromatograph detected nitrogen. **Id.**

Both **In re Fine** and **In re Jones** reject the proposition that the teaching, suggestion or motivation required by §103 is present simply because the references all relate to the same broad category of art or that unsupported general knowledge of one skilled in the art can be relied upon. The Examiner is essentially asserting that it would be obvious for skilled artisans to try the features of one device in another similar device. The CAFC expressly rejected the "obvious to try theory" in **In re Fine** at 1598.

The sole motivation for making the proposed combination is provided by Applicants' specification, which is impermissible hindsight reconstruction. As succinctly stated by the CAFC:

> But this court has said, "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." W. L. Gore , 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one

> skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." Id . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine at 1600.

There are also particular advantages of Applicants' construction that are unique to switched reluctance machines. Sensorless control of brushless permanent magnet machines and induction machines currently do not operate properly if the iron core is heavily saturated with magnetic flux. **Dr. Wallace Declaration** (attached to prior Amendment) at paragraph 5. Switched reluctance machines, on the other hand, are frequently operated with levels of magnetic flux in their iron cores that exceed the levels used in other types of electric machines. **Id.** at paragraph 6. Sensorless control systems for switched reluctance machines do operate properly if the iron core is heavily saturated with magnetic flux. **Id.**

By segmenting the stator and increasing slot fill of the switched reluctance machine, the diameter of the winding wire can be increased using the same number of turns. **Id.** at paragraph 7. The increased diameter of the winding wire allows increased current to be driven through the windings, which increases torque output. **Id.** at paragraph 8. The increased current levels also increase magnetic loading and magnetic saturation. **Id.** at paragraph 9. Therefore, the benefits of a segmented stator in combination with a high slot fill are unique to switched reluctance machines with sensorless drive circuits as claimed in independent claims 1, 11 and 21.

Based on the foregoing, Applicants believe that Claims 1, 11 and 21 are in condition for allowance. The remaining claims are either directly or indirectly dependent upon independent claim 1, 11 and 21 and are allowable for the same reasons.

Claims 9, 19 and 24 stand rejected under 35 U.S.C. § 103 as being unpatentable over Tang (U.S. Patent No. 5,811,905) in view of Takeuchi et al. (U.S. Patent No. 5,583,387) and Oki (JP Pat. No. 411289701A) and further in view of Akita et. al. (U.S. Patent No. 6,369,687).

None of the references show, teach or suggest end caps and retainer sections that are not located between the winding wire and axial sides of the tooth sections. The end caps shown in Akita et al. are located between the winding wire and the axial sides of the tooth sections. The location of the end cap between the winding wire and the axial sides of the tooth sections reduces area that is available for winding wire and reduces the torque density of the machine.

For these reasons, Applicants believe that claims 9, 19 and 24 are in condition for allowance.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the

Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1211.

Respectfully submitted,

Dated: Aug. 19, 2003

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